CLAIMS

1. A method for channel selective power control of a wavelength division multiplexed optical signal, the method including the steps of:

selecting at least one channel within said optical signal having higher than a desired power level;

establishing a resonance to the selected channel, the resonance providing a selection region where said selected channel has a substantially increased power density relative to channels out of resonance; and

attenuating said selected channel a desired amount by adjusting the properties of said selection region.

2. A method as set forth in claim 1, in which the step of selecting at least one channel having higher than a desired power level is performed by means of spectrum analysis of the wavelength division multiplexed optical signal.

3. A method as set forth in claim 1, in which the step of establishing a resonance comprises the steps of

providing an external resonator, which is defined by a first and a second mirror, said first and said second mirror being provided outside and on opposite sides of a waveguiding structure, preferably an optical fibre, carrying the optical signal; and

deflecting light between the waveguiding structure and the external resonator, said deflecting being effected by a deflector provided in said waveguiding structure.

4. A method as set forth in claim 1, in which the step of attenuating is performed by introducing a loss in the selection region.

5. A method as set forth in claim 4, in which the step of attenuating is performed by introducing an absorbing element in the selection region.

6. A method as set forth in claim 3, in which the step of attenuating is performed by introducing an absorbing element inside the external resonator.

7. A method as set forth in claim 4, in which the step of attenuating is performed by making the selection region leaky, light thereby being caused to leak out of the same.

8. A method as set forth in claim 3, in which the step of attenuating is performed by changing the phase of the selected channel in the selection region relative to the phase of the selected channel in the waveguiding structure, thereby causing destructive interference on the selected channel.

9. A method as set forth in claim 8, in which the phase of the selected channel is changed by making a parallel displacement of the first and the second mirror with respect to the waveguiding structure.

10. A method as set forth in claim 8, in which the phase of the selected channel is changed by altering the refractive index in at least some portion of the external resonator, thereby altering the optical path length in the resonator.

11. A method as set forth in claim 9 or 10, further comprising the step of altering the separation between the first and the second mirror.

12. A method as set forth in claim 1, further comprising the steps of

deflecting the selected channel from a first waveguiding structure carrying the optical signal into an external selection region; and

coupling the selected channel from the selection region into a second waveguiding structure;

the step of attenuating the selected channel being performed by absorbing light in said selection region.

13. A method as set forth in claim 12, in which the step of establishing a resonance comprises the step of providing an external resonator enclosing both the first and the second waveguiding structures, said external resonator being defined by a first and a second mirror arranged outside and on opposite sides of the first and the second waveguiding structures.

14. A method as set forth in claim 12, in which the step of establishing a resonance comprises the step of providing at least one Bragg grating in each of the first and the second waveguiding structures.

15. A method as set forth in claim 14, in which at least one of the Bragg gratings is a chirped grating.

16. A method as set forth in any one of the claims 12 to 15, in which the step of deflecting the selected channel from the first waveguiding structure is performed by means of a first blazed phase grating in the first waveguiding structure, and the step of coupling the selected channel into the second waveguiding structure is performed by means of a second blazed grating in the second waveguiding structure.

17. A method as set forth in claim 1, in which the resonance to the selected channel is established by arranging one or several Bragg gratings inside a waveguiding structure, preferably an optical fibre, carrying the optical signal.

18. A method as set forth in claim 17, in which the resonance is established by arranging a chirped Bragg grating in the waveguiding structure, said grating being resonant to different wavelength channels at different portions along the same.

19. A method as set forth in claim 18, in which the selection region is comprised within the resonance, and attenuation is provided by introducing a loss in said selection region.

20. A method as set forth in claim 19, in which the selection region is made leaky by bending a selected portion of the waveguiding structure, light of predominantly the selected channel thereby being caused to leak out from the selection region.

21. A method as set forth in claim 19, in which the selection region is made leaky by moving a light guiding probe close enough to the waveguiding structure to allow evanescent coupling of light from the waveguiding structure into said probe.

22. A method as set forth in claim 3, in which the deflector is provided within an internal resonator in the waveguiding structure, thereby enhancing the spectral selectivity of the channel balancing.

23. A method as set forth in claim 3, further comprising the step of tuning the external resonator to the wavelength of the selected channel.

24. A method as set forth in claim 23, in which the step of tuning the resonance is performed by adjusting the separation between the first and the second mirror.

25. A method as set forth in claim 23, in which the step of tuning the resonance is performed by tilting the external resonator with respect to the waveguiding structure.

26. A method as set forth in claim 23, in which the step of tuning the resonance is performed by

adjusting the separation between the first and the second mirror; and

tilting the external resonator with respect to the waveguiding structure.

27. A method for controlled removal of power from a selected channel within a wavelength division multiplexed optical signal propagating in a waveguiding structure, preferably an optical fibre, comprising the steps of:

establishing a selection region in which the power density of said selected channel is increased relative to other channels within said optical signal; and

removing a controlled amount of power from said selected channel by controlling the properties of said selection region.

28. A method as set forth in claim 27, in which a channel is selected by performing spectrum analysis of the wavelength division multiplexed optical signal, and selecting at least one channel having higher than a desired power level.

29. A method as set forth in claim 27, in which the step of establishing a selection region comprises the step of providing a resonance to the selected channel, in which resonance the power density of the selected channel is increased relative to other channels.

30. A method as set forth in claim 29, in which the selection region is established outside the resonance.

31. A method as set forth in claim 29, in which the selection region is established within the resonance.

32. A method as set forth in claim 27, in which the step of removing a controlled amount of power from the selected channel is performed by introducing a variable loss in the selection region.

33. A method as set forth in claim 32, in which the variable loss is introduced by absorbing a controlled amount of light in the selection region.

34. A method as set forth in claim 27, in which a controlled amount of power is removed by adjusting the properties of the selection region in such a way that destructive interference is achieved, which prevents light from propagating in the waveguiding structure.

35. An arrangement for channel selective power control of a wavelength division multiplexed optical signal propagating in a waveguiding structure, preferably an optical fibre, the arrangement comprising

a spectrum analyser arranged to analyse the power spectrum of said optical signal and to identify and select at least one channel within said optical signal having higher than a desired power level;

an attenuator arranged to attenuate a selected channel within said optical signal; and

a resonator arranged to provide a selection region where the selected channel has a substantially increased power density relative to channels out of resonance,

the attenuator further being arranged to attenuate said selected channel by changing the properties of said selection region.

36. An arrangement as set forth in claim 35, comprising a plurality of attenuators and a plurality of resonators, said attenuators and said resonators being arranged to attenuate a plurality of wavelength channels within a wavelength division multiplexed optical signal.

37. An arrangement as set forth in claim 35, further comprising a controller, said controller being arranged to receive, from the spectrum analyser, information identifying the at least one channel having higher than a desired power level, and to control the attenuator to provide a desired level of attenuation to said at least one channel.

38. An arrangement as set forth in claim 37, wherein the spectrum analyser is operatively connected to the optical fibre upstream from the attenuator.

39. An arrangement as set forth in claim 37, wherein the spectrum analyser is operatively connected to the optical fibre downstream from the attenuator.

40. An arrangement as set forth in claim 38, wherein a second spectrum analyser is operatively connected to the optical fibre downstream from the attenuator, said second spectrum analyser also being operatively connected to the controller.

41. An arrangement as set forth in claim 35, wherein the resonator is an internal resonator arranged in the waveguiding structure, said internal resonator comprising a chirped Bragg grating.

42. An arrangement as set forth in claim 35, wherein the resonator is an external resonator arranged outside the waveguiding structure, said external resonator being defined by two mirrors arranged outside and on opposite

sides of the waveguiding structure, said external resonator being coupled to said waveguiding structure by a deflector.

43. An arrangement as set forth in claim 42, wherein the attenuator is arranged to introduce a loss in the selection region.

44. An arrangement as set forth in claim 42, wherein the attenuator is arranged to change the properties of the selection region in such a way that the phase of light being coupled back into the waveguiding structure from the external resonator is out of phase with light of the resonant wavelength propagating in the waveguiding structure, thereby causing attenuation by destructive interference.

45. An arrangement as set forth in claim 42, wherein a plurality of external resonators is coupled to a common channel of the WDM signal, said plurality of external resonators thereby constituting a set of sub-resonators associated with said channel.

46. An arrangement as set forth in claim 42, wherein the external resonator is adjustable in such way that the wavelength to which the external resonator is resonant can be tuned.

47. An optical device, comprising

a waveguide, preferably an optical fibre, capable of carrying an optical signal having a plurality of wavelength channels;

a resonator operatively connected to said waveguide, the resonator being resonant to at least one wavelength interval within said plurality of wavelength channels, said resonator establishing a region where the resonant wavelength interval has a substantially increased power

density relative to wavelength intervals out of resonance; and

a controller arranged to adjust said resonator such that a controlled amount of power is removed from the resonant wavelength.

48. A device as set forth in claim 47, wherein the resonator is controllable such that the wavelength interval to which the resonator is resonant can be tuned, thereby allowing removal of power from different wavelength intervals at different instants.

49. A device as set forth in claim 47, wherein the resonator is an external resonator arranged outside the waveguide, said external resonator being defined by two mirrors arranged outside and on opposite sides of the waveguide, said external resonator being coupled to said waveguide by a deflector.

50. A device as set forth in claim 49, wherein the deflector comprises a blazed phase grating provided in a core of the waveguide.

51. A device as set forth in claim 49, wherein the controller is operative to change the phase of light of the resonant wavelength in the resonator relative to the phase of light of the same wavelength in the waveguide, thereby causing destructive interference on said wavelength.

52. A device as set forth in claim 51, wherein the controller is operative to change the phase of light in the resonator by causing a parallel displacement of the external resonator with respect to the waveguide.

53. A device as set forth in claim 51, wherein the controller is operative to change the phase of light in

the resonator by causing a change in the refractive index in at least some portion of the external resonator.

54. A device as set forth in claim 49, wherein the controller is operative to provide absorption in the external resonator.

55. A device as set forth in claim 54, further comprising a controllable liquid crystal provided inside the external resonator, the controller being operative to provide absorption by changing the transmittance of said liquid crystal.

56. A device as set forth in claim 47, wherein the resonator is an internal resonator arranged inside the waveguide, said internal resonator comprising at least one Bragg grating.

57. A device as set forth in claim 56, wherein the resonator comprises a chirped Bragg grating.

58. A device as set forth in claim 56 or 57, wherein the waveguide comprises a bend that makes the resonator leaky.

59. A device as set forth in claim 56 or 57, wherein a light guiding probe is arranged within evanescent contact with the waveguide, light thereby leaking out from the resonator to said probe.